Interactive Design of Web User Interface Adaptive Display

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Abstract. Aiming at the weakness of the human-computer interaction function in the current Web user display interface, long system feedback time and high error rate of data query, an interactive Web user interface display interactive design was proposed. Firstly, the requirements of user interface display are analyzed from the aspects of user role positioning, design availability analysis and interaction interface influence factors, and then the interactive scheme research of Web user interface is given. The overall interactive design scheme includes the operating program design, the usability design and the adaptive design of the interface color. From the above three points of view, the function of the design is expounded, and the convenience and friendliness of the interface are improved. Simulation results show that the proposed adaptive interaction design method can effectively shorten the feedback time of the system and reduce the error rate of data query. Adaptive display based on the advantages of human-machine interaction can better meet the needs of Web users.

Keywords: Web user · Display interface · Adaptive · Interactive design

1 Introduction

Web network is a global dynamic text and graphical information interaction system based on HTML and HTTP protocol [1, 2]. The Web user interface is derived from a digital model of the working environment, and provides the user with a full range of three-dimensional internet services by the way of the web site. Web net user interface has always been a visual expression method, and webpage as the carrier's new design. Web network organizes the content [3] of the site based on the user's interaction needs, and adaptively adjusts the contents and overall layout of the interaction display. With the evolution and upgrading of HTML technology, CSS technology has also evolved to the latest generation of. Literature [4] designed a control program based on the Physical Experiment and Industrial Control System (EPICS) architecture to realize remote monitoring of the RF ion source experiment and debugging process. The NBI RF ion source control program is integrated. The development interface (Control System Studio, CSS) interactive interface development module (Best OPI Yet, BOY)

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implements a friendly human-computer interaction interface, uses Jython to implement interface logic, and supports server/client and EPICS communication architectures. Literature [5] designed NBI RF ion source control program realizes friendly human-computer interaction interface through the integrated development platform (Control System Studio, CSS) interactive interface development module (Best OPI Yet, BOY), uses Jython to realize interface logic, supports server/client End and EPICS two communication architectures. The user interface of the web site is no longer only a display of the content of the Internet, it also carries the interaction link with the Web users, and whether the success of the business is also the standard for the design of the Web. Because of the particularity of the Internet, Web user interface design has become an interdisciplinary and cross domain knowledge complex. In order to provide better comprehensive services for the network users, it is necessary to use the Internet technology, human-computer interaction technology, computer graphics, programming and so on to provide more efficient network service [6–8].

2 Web User Interface Adaptive Display Design Requirements

2.1 User Role Positioning

In the overall Web user interface adaptive design, including the most important two design elements, namely human and interactive interface dialogue system. The first requirement of adaptive interface display design is for users of the network to perform roles in the following 5 aspects. (1) The purpose, that is, the use of Web users and the deep motivation of the interactive system, the human-computer interaction interface should meet the user's most basic requirements, so that the function of the system is more comprehensive and intelligent. (2) Behavior, that is, Web users' habit of using man-machine, can understand the user's usage behavior in detail, and be able to do the next work arrangement. (3) Attitude, that is, how Web users perceive their man-machine interaction system, can provide users with the most basic needs. (4) Ability, users have different preferences for network interaction system, each has their own strengths. We should choose the best and most university mode. (5) Skills, the various elements related to the user's needs, the user's personal information, and the use preference of the user, and more accurately grasp the user's use habits through the analysis of the skills.

2.2 Usability Analysis of Prototype Design

Through the analysis of the above role positioning, the key interactive design points are selected and accumulated, that is, user location and user needs, interactive interface design [9, 10] research requirements, as shown in Fig. 1:

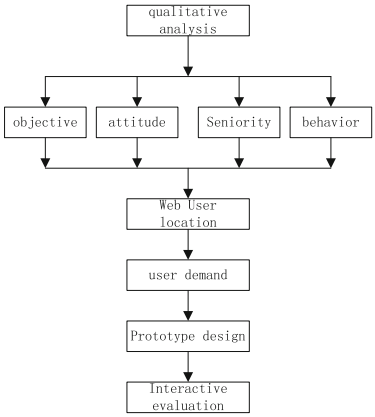

Fig. 1. Web user interface design requirements for adaptive interaction

2.3 Analysis of Factors of Adaptive User Interface Interaction Design

In the process of man-machine interaction between Web users and desktop, there are many factors that will affect the final interaction results. These factors mainly include the user's subjective factors, the user's knowledge reserve, professional background, interest and preference, and personal preference, while the objective factors include the current level of industry development, the hardware configuration used, the software system installed, and the completeness of the adaptable software. These factors affect the final interaction results.

3 Realization of Web User Interface Adaptive Display Interaction Design

Web user interface adaptive display interactive design, including the operating program design, interactive feasibility analysis method and the software interface color adjustment and other different components.

3.1 Operating Program Design

In the beginning of human-computer interaction, it is necessary to sort out the work program of the system first, start the human-computer interaction system and realize the different functions of the system according to the different purposes. Adjusting the various parameters of interface settings mainly includes different functions such as leveling, preheating, document filtering and program classification. The operation interface program design is an important step and key step before the prototype design. The specific execution procedure is shown in Fig. 2.

File filtering is one of the key steps in Web user interface adaptive display and interactive design, which is part of pseudo code designed for file filter program.

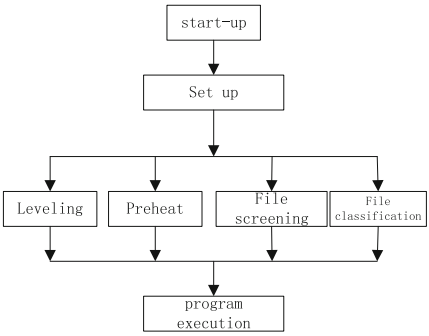

Fig. 2. The operation interface program design

```
DFJJINFRRS=”” **
USEdedeSDK=””
&SQL（Var intern=document fofo
Var intern=session CAL
&SQL（.i Sussess  return 0***;
.iiiie return 1***
sjly Var inrin=startdate,zdh****
coce=1:f_endmrld
QQJ（insert into MRIP_dailydata）
.isussess  return****
WRLKPIname
```

Through the operation of the pseudo code, the Web user interface adaptive display interactive design can be realized, and the files can be filtered effectively. First, through the interface program flow, complete the initial adaptive display steps, then file filtering, input the pseudo code, to achieve the design of display interaction.

3.2 Usability Analysis

Based on 2.1 program setting and research analysis results, this paper uses a comprehensive heuristic result understanding scheme to analyze the feasibility of the adaptive interaction scheme. In the selection of the scheme and the feasibility evaluation, in order to select the best and high quality interactive scheme, this paper uses multiple linear regression to determine the feasibility of the interaction scheme. Assuming that the Web user interface adaptively displays interactive design, the multiple linear regression model is as follows:

$$y = \xi_0 + \xi_1 x + \tau \tag{1}$$

Among them, ξ_0 and ξ_1 are the system parameters of multiple linear regression models, and τ is the error of model selection. At this time, a set of constant $\{(x_i, y_i), i = 1, 2, 3, \ldots, n\}$ for basic program selection is given, based on least squares and multiple linear regression models for classification and digital prediction.

$$\hat{y} = \hat{\xi}_0 + \hat{\xi}_1 x \tag{2}$$

The parameters $\hat{\alpha}_0$ and $\hat{\alpha}_1$ of the new human-computer interaction system are the least squares estimation of the parameters ξ_0 and ξ_1 of the multiple linear regression model. The goodness of fit of the detection system is W^2, which describes the relationship between the explanatory variable and the explanatory variable, that is, it can determine the feasibility of the final human-computer interaction scheme with the explanatory variable.

$$W^2 = \frac{W_1^2}{W_2^2} = \frac{\sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2} = 1 - \frac{\sum_{i=1}^{n} (\bar{y} - \hat{y}_i)^2}{\sum_{i=1}^{n} (\bar{y} - y_i)^2} \tag{3}$$

Among them, W_1^2 and W_2^2 are $\sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2$ and $\sum_{i=1}^{n} (y_i - \bar{y})^2$ respectively, so the coefficient of determination of the model is η: the square of correlation coefficient.

$$\eta = \frac{\left[\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})\right]^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2 \sum_{i=1}^{n} (y_i - \bar{y})^2} \tag{4}$$

Evaluation and cognitive process browsing are two evaluation methods to analyze the usability of the design prototype, and the evaluation method of cognitive process browsing also requires a Web user to participate in it. The evaluation method also describes the whole operation process to improve the user's understanding and understanding of the human-computer interaction function of the Web interface.

3.3 Implementation of Software Interface Color Selection and Adaptive Interaction Design

Color design is also a key part of the whole Web user adaptive interface design. Color can give Web users the feeling of beauty. The color design of software interface represents the user's first impression and determines the operation efficiency of users in the whole environment. Different colors have different psychological hints, which bring different user experience to Web users. In the human-computer interaction process of network users, users need to obtain accurate human interaction information, more need

to get a beautiful feeling and good interaction system. The color of the system UI interface will determine the loyalty of the user to a great extent. The main color matching of the interface and the color of the key prompt should not only express the information accurately, but also play an important role in accurately communicating the information. Adaptive interface display has powerful system function, which can provide a variety of options according to different user's Web user preferences. For example, some users prefer lively warm hue, some users like quiet cold hue, adaptive display scheme can provide users with multiple choices and bring more relaxed and good users. Good experience.

In this paper, an adaptive interactive mode is designed to design the specific operation program and color selection method. Based on the multiple linear regression method, the feasibility of the specific design scheme is determined to meet the network needs of different Web users.

4 Experimental Results and Analysis

4.1 Setting of Experimental Environment

The purpose of the simulation experiment is to verify the superiority and effectiveness of the adaptive display interface design compared with the traditional design. The simulation experiment environment is composed of multiple network servers and user's terminal interaction interface systems. The related network service level and network parameters are set, as shown in Tables 1 and 2, respectively.

Table 1. Service level and systematization initial value

Service distribution level	Upper limit value	Lower limit value
1 Lower	25	8
2 Intermediate	32	15
3 Senior	41	25

4.2 Experimental Results and Analysis

This paper first verifies the adaptive Web user interaction time, because the design has an adaptive advantage and can balance the load capacity of the system, so it has a significant advantage in the response time of human-computer interaction. The number of samples selected is 200. The average response time of this paper is about 0.2 s, and it is stable in the whole sample space, and there is no obvious fluctuation. And the interaction time of the traditional interactive mode not only exceeds the design scheme in each sample space range, but also is not good in the stability performance.

As shown in Fig. 3, comparing the system response time of the proposed method with the traditional method, the number of samples in 200 groups is selected. The response time of this method fluctuates greatly, while the response time of the traditional method is relatively stable. When the number of test samples is 100, the response time of this method is 0.52 s; the response time of the traditional method is 0.2 s, the biggest difference.

Table 2. Experimental parameter setting

	Web parameters	Set value
Human-computer interaction system	Equipment model	*RRITD* – 8.0
	RAM	8 G
	Bandwidth	100 M
	CPU	G850
	Highest primary frequency	2.8 GHz
	Development tool	VS 2013
	Operating system	Windows 10

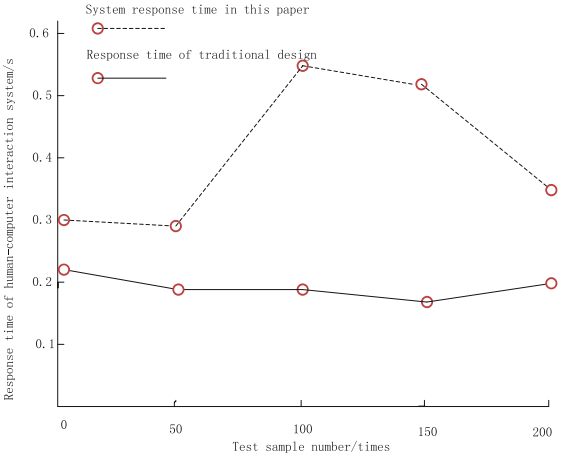

Fig. 3. System response time comparison

The design has obvious advantages in the error rate control of data query. As shown in Fig. 4, the error rate of data query in this paper can be controlled within 0.2%, which is better than the traditional human-computer interaction design.

The error rate of the traditional human-machine interaction system is close to 0.4%, and the fluctuation is large and the stability is not enough in the whole range of sample changes. The results of the data analysis prove that the adaptive display based on the advantages of human-machine interaction design in terms of functionality can better meet the needs of Web users.

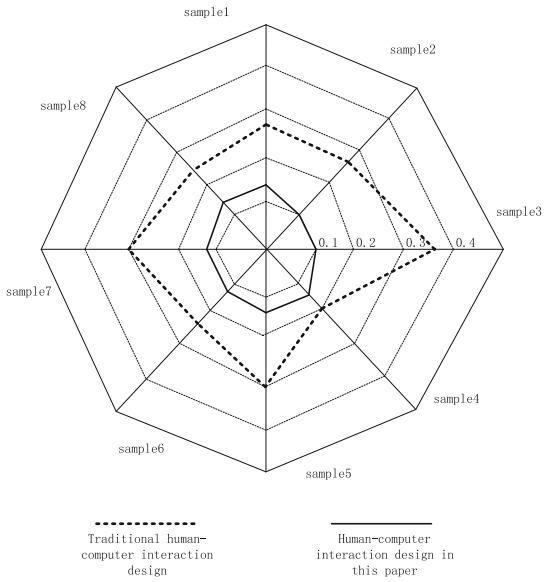

Fig. 4. Common SDN network user control error rate performance

5 Concluding Remarks

Whether the display interface of human-computer interaction is friendly and convenient will ultimately determine the number of access to Web users. This article has designed a Web user interaction mode under the adaptive mode for the shortcomings of the traditional human-computer interaction system. The article gives the concrete control and feasibility scheme demonstration, and the simulation experiment results also prove the article. The superiority and applicability of the design.

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